CLAIMS

What is claimed is:

1. A method to measure local streaming potential for monitoring the progress of membrane fouling in the course of filtration of a hollow-fiber membrane, wherein the value of zeta potential (ζ) is obtained from the following equation (I) while introducing a given solution inside a membrane module that contains a hollow-fiber membrane, after measuring pressure difference across the membrane pores while measuring conductivity and pH of a given solution, measuring streaming potential difference between an upper and a lower regions of a membrane pore at a given position designated by electrodes which are installed both inside and outside of an inlet and an outlet of a membrane module

$$\frac{\Delta V}{\Delta P} = \frac{\varepsilon \zeta}{\lambda \eta} \quad \text{(I)}$$

wherein ΔV represents streaming potential difference obtained when a given pressure difference is ΔP; ε represents dielectric constant; λ represents conductivity of a solution; η represents viscosity of a solution.

2. The method to measure local streaming potential for monitoring the progress of membrane fouling in the course of filtration of a hollow-fiber membrane according to claim 1, wherein said pressure difference across the membrane pores can be adjusted up to 0.3% of the maximum flow rate by using both a pressure gauge and a minute flow-control valve installed on the outlet.

3. An apparatus to measure local streaming potential for monitoring the progress of membrane fouling in the course of filtration of a hollow-fiber membrane, wherein said apparatus comprises a feed tank to reserve feed solution in a state of

colloidal suspension; a delivery pump to deliver said feed solution; a membrane module with several hollow-fibers through which said feed solution is introduced and released; internal and external electrodes installed respectively on an upper and a lower regions of a membrane pore of a hollow-fiber at inlet and outlet of a membrane module and are used in measuring streaming potential; a means to measure physical properties of said feed solution being introduced into a membrane module; a pressure meter that measures the pressure difference both at inlet and outlet of a membrane module; a minute flow-control valve to adjust pressure difference present across the membrane pores; a means to display and record data being obtained from the above-mentioned measuring devices; and a means to calculate the value of zeta potential (ζ) of a hollow-fiber membrane.

4. The apparatus to measure local streaming potential for monitoring the progress of membrane fouling in the course of filtration of a hollow-fiber membrane according to claim 3, wherein said hollow-fiber membrane, the place where said filtration is conducted, is bundled with epoxy resin potting to separate feed solution and permeate.

5. The apparatus to measure local streaming potential for monitoring the progress of membrane fouling in the course of filtration of a hollow-fiber membrane according to claim 3, wherein the electrodes installed inside said hollow-fiber membrane are wire-type Ag/AgCl electrodes of 0.25 mm in diameter that cover about 6% of the total internal cross-sectional area while the electrodes installed outside said hollow-fiber membrane are spiral electrodes of the same material.

6. The apparatus to measure local streaming potential for monitoring the progress of membrane fouling in the course of filtration of a hollow-fiber membrane according to claim 3, wherein said minute flow-control valve can perform a fine adjustment up to 0.3% of the maximum flow rate.

7. The apparatus to measure local streaming potential for monitoring the progress of membrane fouling in the course of filtration of a hollow-fiber membrane according to claim 3, wherein data obtained from the devices mentioned in the claim 3 are displayed and recorded using a multi-channel digital multi-meter and a computer, and the value of zeta potential of a hollow-fiber membrane is calculated by using the equation (I), wherein ΔV represents streaming potential difference obtained when a given pressure difference is ΔP; ε represents dielectric constant; λ represents conductivity of a solution; η represents viscosity of a solution.